

## WHAT IS CLAIMED IS:

1. A system for polishing surfaces of objects comprising:

a polishing unit that is configured to polish said objects; and

a pair of interface mechanisms that are each configured to transfer some of said objects to said polishing unit and to transfer some of said objects that have been polished from said polishing unit, said pair of interface mechanisms cooperatively transferring said object to and from said polishing unit to efficiently process said objects through said polishing unit.

2. The system of claim 1 further comprising a post-polishing unit that is configured to process said objects after said objects have been polished by said polishing unit, said post-polishing unit being positioned such that at least one of said pair of interface mechanisms can transfer some of said objects from said polishing unit to said post-polishing unit.

3. The system of claim 2 further comprising:

a supply unit that provides said objects, said supply unit being positioned such that said post-polishing unit is positioned between said polishing unit and said supply unit; and

a supply mechanism that is configured to transfer said objects from said supply unit to said pair of interface mechanisms.

4. The system of claim 3 wherein said supply unit includes an object load assembly and an object unload assembly, each of said object load assembly and said object unload assembly being configured to vertically position a plurality of object storage housings.

5. The system of claim 4 wherein one of said object load assembly and said object unload assembly is configured to vertically move said plurality of object storage housings.

5 6. The system of claim 3 wherein said supply mechanism is configured to be mobile to travel between said supply unit and said interface mechanisms to transfer said objects from said supply unit to said interface mechanisms.

10 7. The system of claim 3 wherein said supply unit includes an object storage housing that is configured to be mobile to travel from said supply unit to said supply mechanism.

8 8. The system of claim 3 wherein said post-polishing unit includes a first object cleaner that is configured to clean some of said objects that have been polished by said polishing unit.

9 9. The system of claim 8 wherein said first object cleaner includes a thickness measurement unit to measure the thickness of features on said surfaces of said objects.

20 10. The system of claim 8 further comprising a dual-functioning object transfer mechanism that is positioned to transfer said objects from said supply unit to said supply mechanism and to transfer some of said objects from said first object cleaner to said supply unit.

25 11. The system of claim 10 wherein said dual-functioning object transfer mechanism is configured to be mobile to have access to different sections of said supply unit.

12. The system of claim 8 wherein said post-polishing unit further includes a second object cleaner that is configured to clean some of said objects that have been polished by said polishing unit, said first object cleaner being positioned on one side of said supply mechanism between said polishing unit and said supply unit, said  
5 second object cleaner being positioned on an opposite side of said supply mechanism between said polishing unit and said supply unit.

13. The system of claim 12 wherein said post-polishing unit includes first and second secondary polishers to further polish some of said objects that have been  
10 polished by said polishing unit, said first secondary polisher being positioned on the same side of said supply mechanism as said first object cleaner, said second secondary polisher being positioned on the same side of said supply mechanism as said second object cleaner.

14. The system of claim 13 wherein said post-polishing unit includes third and fourth secondary polishers to further polish some of said objects that have been  
15 polished by said polishing unit, said third secondary polisher being positioned on the same side of said supply mechanism as said first object cleaner, said fourth secondary polisher being positioned on the same side of said supply mechanism as said second object cleaner.  
20

15. The system of claim 14 wherein said first and third secondary polishers are vertically positioned such that said first secondary polisher is situated below said third secondary polisher, and wherein said second and fourth secondary polishers  
25 are vertically positioned such that said second secondary polisher is situated below said fourth secondary polisher.

16. The system of claim 8 wherein said post-polishing unit includes a first secondary polisher to further polish some of said objects that have been polished by said polishing unit, said first secondary polisher being positioned on one side of said supply mechanism between said polishing unit and said supply unit, said first object cleaner being positioned on an opposite side of said supply mechanism between said polishing unit and said supply unit.

17. The system of claim 3 wherein said supply unit includes an object load assembly that is configured to vertically position a plurality of object storage housings.

18. The system of claim 17 wherein said object load assembly is configured to vertically move said plurality of object storage housings.

19. The system of claim 17 wherein said supply unit further includes object unload assemblies that are each configured to vertically position a plurality of object storage housings.

20. The system of claim 19 wherein at least one of said object unload assemblies is configured to vertically move said plurality of object storage housings that are positioned by that object unload assembly.

21. The system of claim 1 further comprising a first object transfer station to receive said objects that are to be transferred to said polishing unit by one of said pair of interface mechanisms.

22. The system of claim 21 wherein said first object transfer station includes a thickness measurement unit to measure the thickness of features on said surfaces of said objects.

23. The system of claim 21 further comprising a second object transfer station to receive said objects that have been polished by said polishing unit, said second object transfer station being vertically positioned with respect to said first object transfer station.

5

\ 24. A system for polishing surfaces of objects comprising:

a supply unit that is configured to accommodate a plurality of said objects;

a polishing unit that is configured to polish said objects;

10

a post-polishing unit that is configured to process said objects after being polished by said polishing unit;

an intermediate object transfer mechanism that is configured to transfer said objects between said polishing unit and said post-polishing unit; and

a supplying mechanism that is configured to transfer said objects from said supply unit to said intermediate object transfer mechanism such that said objects can be relayed to said polishing unit.

20  
25  
30  
35  
40  
45  
50  
55  
60  
65  
70  
75  
80  
85  
90  
95  
100

25. The system of claim 24 wherein said intermediate object transfer mechanism includes a first object transfer device and a second object transfer device that are configured to selectively transfer objects to and from said polishing unit.

26. The system of claim 25 wherein one of said first and second object transfer devices is configured to directly transfer some of said objects from said polishing unit to said post-polishing unit.

25

27. The system of claim 24 wherein said supply unit includes an object load assembly and an object unload assembly, each of said object load assembly and said object unload assembly being configured to vertically position a plurality of object storage housings.

30

28. The system of claim 27 wherein one of said object load assembly and said object unload assembly is configured to vertically move said plurality of object storage housings.

5 29. The system of claim 24 wherein said supply mechanism is configured to be mobile to travel between said supply unit and said intermediate object transfer mechanism to transfer said objects from said supply unit to said intermediate object transfer mechanism.

10 30. The system of claim 24 wherein said supply unit includes an object storage housing that is configured to be mobile to travel from said supply unit to said supply mechanism.

15 31. The system of claim 24 further comprising a dual-functioning object transfer mechanism that is positioned to transfer said objects from said supply unit to said supply mechanism and to transfer some of said objects from said post-polishing unit to said supply unit.

20 32. The system of claim 31 wherein said dual-functioning object transfer mechanism is configured to be mobile to have access to different sections of said supply unit.

25 33. The system of claim 24 wherein said post-polishing unit includes a first object cleaner that is configured to clean some of said objects that have been polished by said polishing unit.

30 34. The system of claim 33 wherein said first object cleaner includes a thickness measurement unit to measure the thickness of features on said surfaces of said objects.

35. The system of claim 33 wherein said post-polishing unit includes a secondary polisher to further polish some of said objects that have been polished by said polishing unit, said secondary polisher being positioned on one side of said supply mechanism between said polishing unit and said supply unit, said first object cleaner being positioned on an opposite side of said supply mechanism between said polishing unit and said supply unit.

36. The system of claim 33 wherein said post-polishing unit further includes a second object cleaner that is configured to clean some of said objects that have been polished by said polishing unit, said first object cleaner being positioned on one side of said supply mechanism between said polishing unit and said supply unit, said second object cleaner being positioned on an opposite side of said supply mechanism between said polishing unit and said supply unit.

37. The system of claim 36 wherein said post-polishing unit includes first and second secondary polishers to further polish some of said objects that have been polished by said polishing unit, said first secondary polisher being positioned on the same side of said supply mechanism as said first object cleaner, said second secondary polisher being positioned on the same side of said supply mechanism as said second object cleaner.

38. The system of claim 37 wherein said post-polishing unit includes third and fourth secondary polishers to further polish some of said objects that have been polished by said polishing unit, said third secondary polisher being positioned on the same side of said supply mechanism as said first object cleaner, said fourth secondary polisher being positioned on the same side of said supply mechanism as said second object cleaner.

39. The system of claim 38 wherein said first and third secondary polishers are vertically positioned such that said first secondary polisher is situated below said third secondary polisher, and wherein said second and fourth secondary polishers are vertically positioned such that said second secondary polisher is situated below said fourth secondary polisher.

40. The system of claim 24 wherein said supply unit includes an object load assembly that is configured to vertically position a plurality of object storage housings.

41. The system of claim 40 wherein said object load assembly is configured to vertically move said plurality of object storage housings.

42. The system of claim 41 wherein said supply unit further includes object unload assemblies that are each configured to vertically position a plurality of object storage housings.

43. The system of claim 42 wherein at least one of said object unload assemblies is configured to vertically move said plurality of object storage housings that are positioned by that object unload assembly.

44. The system of claim 24 further comprising a first object transfer station to receive said objects that are to be transferred to said polishing unit by said intermediate object transfer mechanism.

45. The system of claim 44 wherein said first object transfer station includes a thickness measurement unit to measure the thickness of features on said surfaces of said objects.



46. The system of claim 44 further comprising a second object transfer station to receive said objects that have been polished by said polishing unit, said second object transfer station being vertically positioned with respect to said first object transfer station.

5

47. A method of processing objects to be polished comprising:

selectively transferring said objects to a polishing unit of a polishing system using first and second object transfer mechanisms such that some of said objects are transferred to said polishing unit by said first object transfer mechanism and some of said objects are transferred to said polishing unit by said second object transfer mechanism; and

10

selectively transferring said objects that have been polished from said polishing unit of said polishing system using said first and second object transfer mechanisms such that some of said objects are transferred from said polishing unit by said first object transfer mechanism and some of said objects are transferred from said polishing unit by said second object transfer mechanism.

15  
20  
25

48. The method of claim 47 further comprising:

transferring said objects from a supply unit of said polishing system to an interface region of said polishing system through an object transfer region of said polishing system, said interface region including said first and second object transfer mechanisms; and

transferring said objects that have been polished from said polishing unit to a post-polishing unit of said polishing system.

25

49. The method of claim 48 further comprising measuring the thickness of features on surfaces of said objects at a measurement station of an object cleaner of said post-polishing unit.

30

50. The method of claim 48 wherein said step of transferring said objects that have been polished from said polishing unit to said post-polishing unit includes:

transferring some of said objects to an object cleaner of said post-polishing unit to clean said objects; and

5 transferring some of said objects to a secondary polisher of said post-polishing unit to further polish said objects, said object cleaner being positioned on one side of said object transfer region between said polishing unit and said supply unit, said secondary polisher being positioned on an opposite side of said object transfer region between said polishing unit and said supply unit.

10 51. The method of claim 48 wherein said step of transferring said objects that have been polished from said polishing unit to said post-polishing unit includes:

transferring some of said objects to a first object cleaner of said post-polishing unit to clean said objects; and

5 transferring some of said objects to a second object cleaner of said post-polishing unit, said first object cleaner being positioned on one side of said object transfer region between said polishing unit and said supply unit, said second object cleaner being positioned on an opposite side of said object transfer region between said polishing unit and said supply unit.

20 52. The method of claim 51 wherein said step of transferring said objects that have been polished from said polishing unit to said post-polishing unit includes selectively transferring some of said objects to first and second secondary polishers of said post-polishing unit to further polish said objects, said first secondary polisher being positioned on the same side of said object transfer region as said first object cleaner, said second secondary polisher being positioned on the same side of said object transfer region as said second object cleaner.

53. The method of 48 further comprising a step of laterally moving an object storage housing from said supply unit across a portion of said object transfer region of said polishing unit to position said object storage housing closer to said interface region of said polishing system.

5

54. The method of 47 further comprising a step of vertically moving a plurality of object storage housings within said supply unit of said polishing system.

10

55. The method of claim 47 wherein said step of transferring said objects from said supply unit of said polishing system to said interface region of said polishing system through said object transfer region of said polishing system includes serially relaying said objects to third and fourth object transfer mechanisms to transfer said objects from said supply unit to said interface region, said third and fourth object transfer mechanisms being positioned in said object transfer region of said polishing system.

15

56. The method of claim 55 further comprising a step of transferring some of said objects from said post-polishing unit to said supply unit using said third object transfer mechanism.

20

57. A method of processing objects to be polished comprising:

transferring said objects from a supply unit of a polishing system to an interface region of said polishing system through an object transfer region of said polishing system, said object transfer region being located between said supply unit and said interface region;

25

transferring said objects from said interface region to a polishing unit of said polishing system; and

transferring said objects from said polishing unit to a post-polishing unit of said polishing system.

30

58. The method of claim 57 wherein said step of transferring said objects from said interface region to said polishing unit of said polishing system includes selectively transferring said objects to said polishing unit using first and second object transfer mechanisms such that some of said objects are transferred by said first object transfer mechanism and some of said objects are transferred by said second object transfer mechanism.

59. The method of claim 57 further comprising measuring the thickness of features on surfaces of said objects at a measurement station of an object cleaner of said post-polishing unit.

60. The method of claim 57 wherein said step of transferring said objects from said polishing unit to said post-polishing unit includes:

transferring some of said objects to an object cleaner of said post-polishing unit to clean said objects; and

transferring some of said objects to a secondary polisher of said post-polishing unit to further polish said objects, said object cleaner being positioned on one side of said object transfer region between said polishing unit and said supply unit, said secondary polisher being positioned on an opposite side of said object transfer region between said polishing unit and said supply unit.

61. The method of claim 57 wherein said step of transferring said objects from said polishing unit to said post-polishing unit includes:

transferring some of said objects to a first object cleaner of said post-polishing unit to clean said objects; and

transferring some of said objects to a second object cleaner of said post-polishing unit, said first object cleaner being positioned on one side of said object transfer region between said polishing unit and said supply unit, said second object cleaner being positioned on an opposite side of said object transfer region between said polishing unit and said supply unit.

62. The method of claim 61 wherein said step of transferring said objects from said polishing unit to said post-polishing unit includes selectively transferring some of said objects to first and second secondary polishers of said post-polishing unit to further polish said objects, said first secondary polisher being positioned on the same side of said object transfer region as said first object cleaner, said second secondary polisher being positioned on the same side of said object transfer region as said second object cleaner.

63. The method of 58 further comprising a step of vertically moving a plurality of object storage housings within said supply unit of said polishing system.

64. The method of claim 57 wherein said step of transferring said objects from said supply unit of said polishing system to said interface region of said polishing system through said object transfer region of said polishing system includes serially relaying said objects to first and second object transfer mechanisms to transfer said objects from said supply unit to said interface region, said first and second object transfer mechanisms being positioned in said object transfer region of said polishing system.

65. The method of claim 64 further comprising a step of transferring some of said objects from said post-polishing unit to said supply unit using said first object transfer mechanism.

66. The method of 57 further comprising a step of laterally moving an object storage housing from said supply unit across a portion of said object transfer region of said polishing system to position said object storage housing close to said interface region of said polishing system.